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ABSTRACT

While all languages use shape to classify unfamiliar objects, some languages as diverse as Mandarin, Thai, Japanese, Mohawk, and American Sign Language lexicalize these and other types of description as noun classifiers. Classification does not develop from a fixed set of features in the object, but is discourse-sensitive and invoked when it would add information for the listener. Children and adults develop classifiers in the same order, and four stages of classifier development are seen: (1) no classifiers at all; (2) division of animates and inanimates; (3) shape classification by one, two, and then three dimensions; and (4) conventionalization of functional classifiers. Shape is the most common feature chosen for classification. Classification by shape rather than function is reinforced by informativeness, natural forms, perceptual development, and cross-sensory reinforcement, and it develops out of universal, biologically structured experience rather than purely linguistic functions. Although adults have more sophisticated functional and stylistic categories than children, when either is under communicative stress, both revert to the same simplified pragmatic mode of using common, perceptually-based classifiers that they can count on their listeners to understand. (MSE)

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"SCISSORS, PAPER, STONE:" PERCEPTUAL FOUNDATIONS OF NOUN CLASSIFIER SYSTEMS

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I THE PRIMACY OF SHAPE IN CLASSIFIER SYSTEMS

Shape is a more basic and stable sorting category than function. Two-year-old Chinese and Japanese children use the same order of invention and generalization in acquiring noun classifier systems as dozens of unrelated languages have used in their historical development of classifiers. This is because both adults and children share a common perceptual system, a common sensori-motor experience with the world, and a common sense of the relative informativeness of shape in descriptions. Both the children and the adults develop shape classifiers in this order: one-dimensional, long extended objects two-dimensional flat ones three-dimensional solid, round, lumpish ones.

The common guessing game, "scissors, paper, stone," uses exactly the same maximal contrasts. "Scissors" points two fingers vertically; for "paper" the palm is spread flat parallel to the ground, while "stone" is a closed, tight fist. Two-year-olds can name and produce the hand shapes long before they can learn the rules to the game. Both children and adults independently re-invent language to describe the same three-way shape distinctions which their hands have taught them first.

While all languages use shape to describe unfamiliar objects, some languages as diverse as Mandarin, Thai, Japanese, Mohawk, and American Sign Language, lexicalize these and other types of description as noun classifiers. In classifier languages, most if not all, nouns add an additional morpheme when they appear with a number or a determiner. In Mandarin, for example, we must say "a long-thing dragon," yí-tiáo lóng and "a pointed-thing hat," yí-dǐng màozi, to mean "a dragon" or "a hat." Simple *yí-lóng and *yí-màozi are not acceptable. While modern Mandarin dictionaries list about 150 classifiers, most educated adults commonly confine themselves to a core set of a few dozen classifiers which are the same ones the child acquires earliest.

Mandarin, like most classifier languages, also has a general classifier for objects which either do not have a special classifier, or which are clear from context. For example, one might say either "that flat-thing table," nèi-zhāng zhuōzi or "that general-thing table," nèi-ge zhuōzi. In Mandarin, the general classifier is used many hundreds of times more frequently than the specific classifiers. Neither children nor adults ever omit any obligatory classifier in its slot, but both frequently use the general classifier where both prescriptive grammar and self-report would claim a specific classifier is required. Classification does not develop out of a fixed, inherent set of features in the object. Instead, it is a discourse-sensitive tool which is invoked optionally when it would add useful extra information for the hearer, particularly in describing distant, disputed, non-present, requested, or imaginary items.

Both children and adults develop classifiers in the same order. Figure one synthesizes common trends in the cross-linguistic historical development of more than a dozen classifier systems, including Chinese, Japanese, and Thai. Figure two illustrates the acquisition of classifiers by four Mandarin-speaking two-year-olds, while Figure 3 shows cross sectional classifier distinctions among two to six-year-old Japanese children. For all speakers, the most likely objects to take special classifiers are small, solid objects which are culturally valued, such as flowers, books, hats, clothing, domestic animals, jewels, weapons, vehicles, and fruit and other foods. All are physically manipulable. Historically, classifiers develop most easily through trade, where these and other items are being counted, inventoried, and disputed.

Children and languages follow parallel courses in their development. I) an early stage with no classifiers at all. [2] At Stage II, animates divide themselves from inanimates, then humans from animals.

At Stage III a prototypical object is generalized according to shape: first, one-dimensional, typically from a word for tree, log or branch. Next a two-dimensional classifier marks flat things, usually leaves or blankets. Three-dimensional classifiers quickly subdivide into more or less spherical, fruit-shaped objects, as opposed to tiny, hard, nut or grain-like ones.

At Stage IV, functional classifiers are conventionalized. Function classifiers are much less generalizable, though they often include classifiers for things with handles, vehicles, weapons, clothing, and furniture. Very large, distant, or unique objects such as the sun, and amorphous ones, such as the ocean or the wind are seldom classified. While any classifier may be generalized, shape is by far the most common feature. For example, chairs in Thai take the animal classifier because they have four legs, while laws in Chinese take the one-dimensional tiao because they used to be written vertically down the page.

II REINFORCEMENT FOR SHAPE CLASSIFIERS

Classification by shape rather than by function is reinforced by: A) Informativeness, B) Natural forms, C) Perceptual development, and D) Cross-sensory reinforcement. All these factors converge to make one-dimensional extension a privileged category. Classifiers develop out of a universal, biologically-structured experience with the world rather than from purely linguistic vsubroutines which are peculiar to a minority of world languages.

II.A EVIDENCE FROM LANGUAGE: OVEREXTENSIONS. Young children's semantic overextensions are perceptually based. (E. Clark, 1977.) Generalization by overall shape greatly exceeds extensions by size or still more transient sensory features such as sound or smell. Children are particularly likely to generalize from small round objects, though long slender objects such as rulers and umbrellas also precipitate overextensions. Clark also notes the primacy of the vertical dimension, with a preference for mapping a single primary dimension. The Chinese children overextended classifiers exactly according to these features. They frequently overextended shape, especially one-dimensional extension, to classify objects which are sorted functionally. In contrast, I found only a single example of overextension by function: using the jiàn clothing classifier to describe a shoe, rather than zhī for

FIGURE 1
TYPICAL HISTORICAL DEVELOPMENT OF NOUN CLASSIFIERS

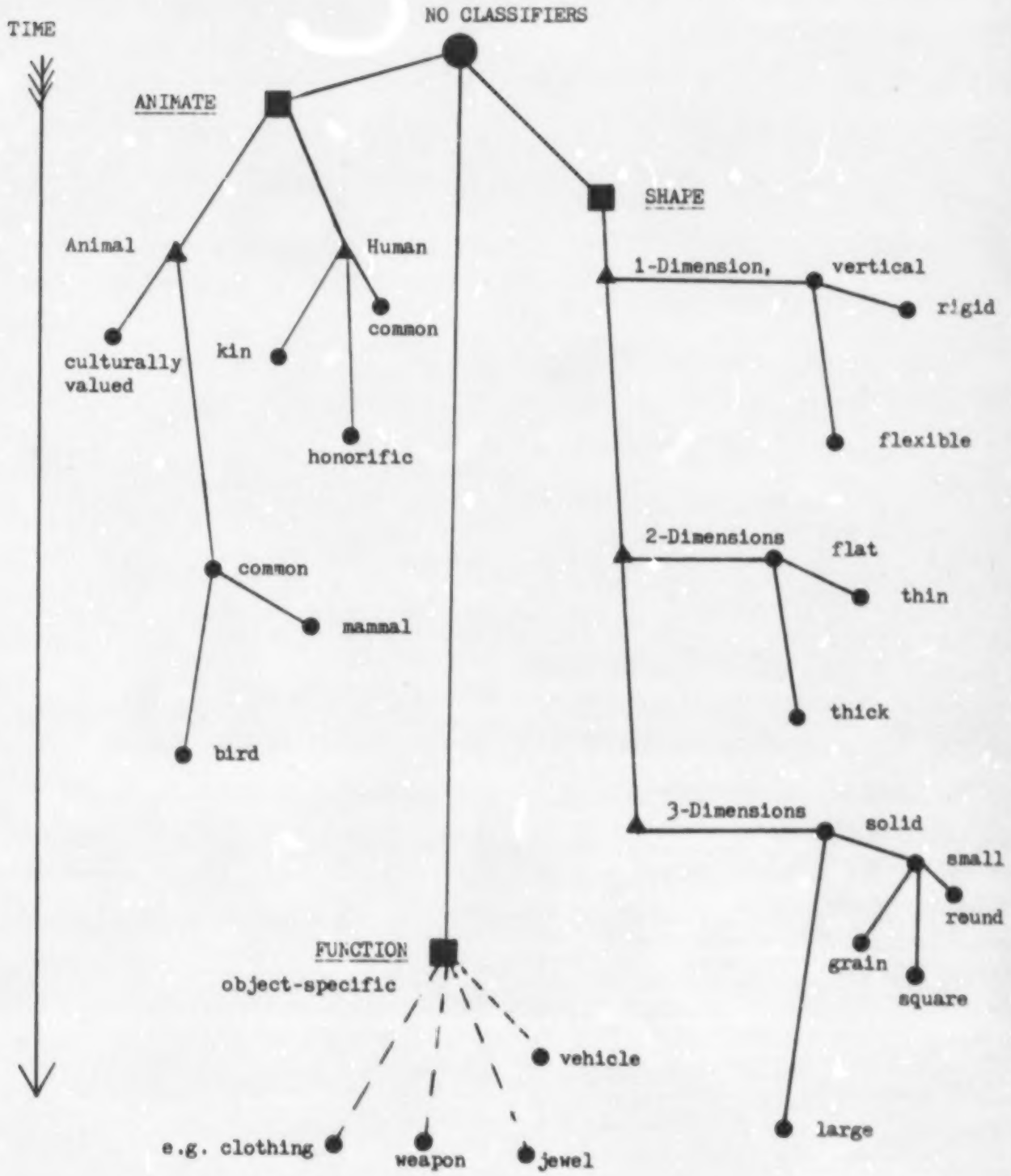


FIGURE 2

MANDARIN SPECIAL CLASSIFIER ACQUISITION FOR FOUR CHINESE CHILDREN

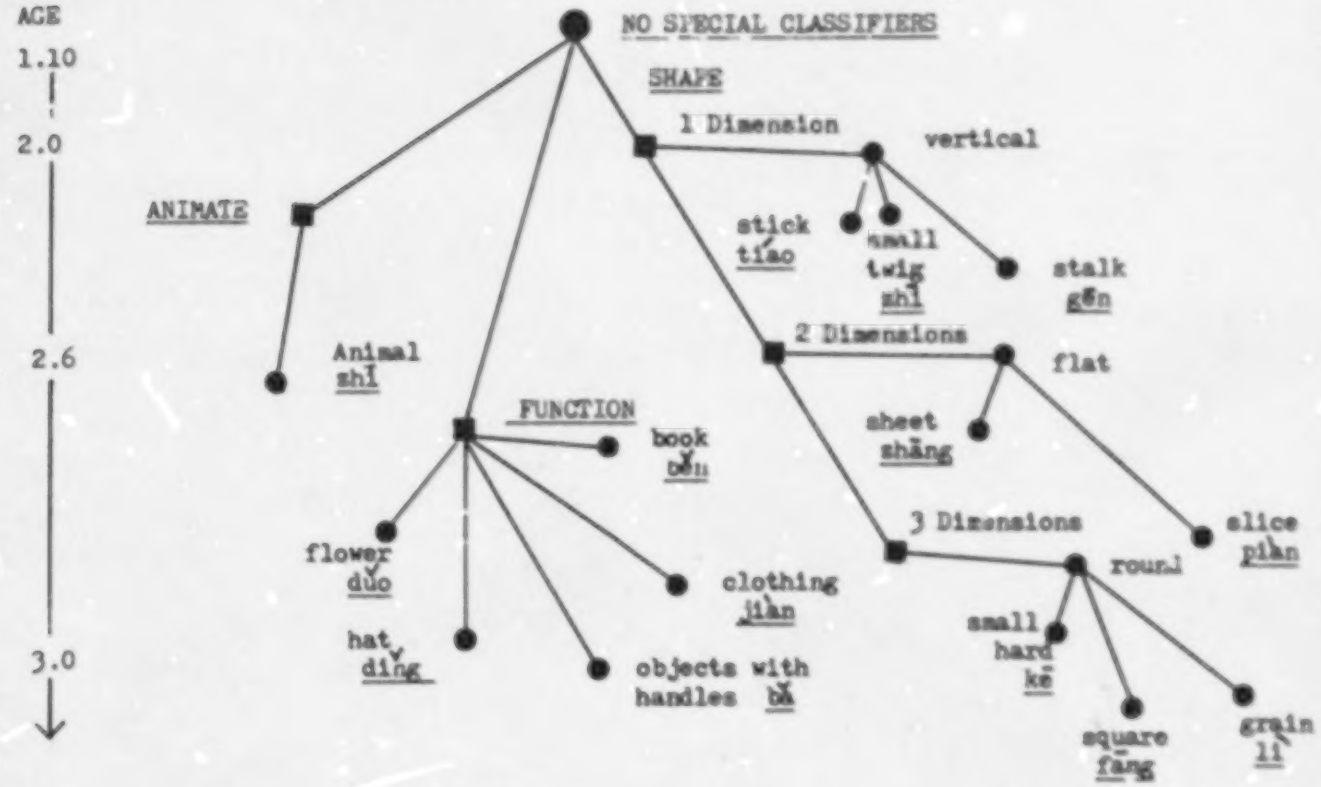
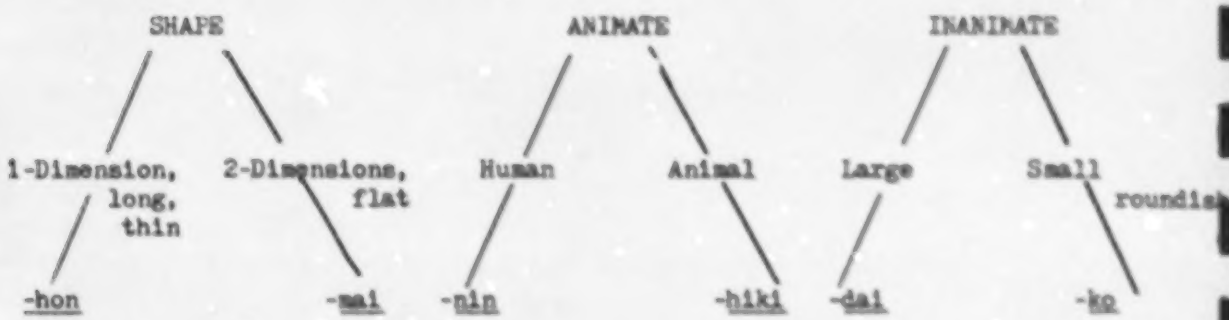


FIGURE 3

JAPANESE NOUN CLASSIFIERS USED BY TWO-THROUGH-SIX-YEAR-OLDS



*Adapted from M. Sanches, p. 59

small, slender, solid objects.

Overextensions for one-dimensional extended objects include: tiáo misused for: a sword and a gun, both of which require the bǎ classifier for objects with handles; a ladder, a long handkerchief which was pinned to hang down a pinafore, a shoe, and a purse hanging from a long strap. Another one-dimensional classifier, gēn "stalk," was extended to include both a pistol, which should take bǎ "handle," and a flower, which should take duǒ "bud." There were no overextensions for two-dimensional flat objects, and only two for the small round, hard objects which Clark found extended so frequently. One extended lì "grain" to describe a cardboard puzzle piece, while the other used kē "small round thing" rather than zhī "animal" to refer to the monkey hero of the Chinese classic Monkey who was pictured being born out of a boulder which was exploding into pebbles.

In every overextension except the monkey, the child had frequently handled the object he or she was describing, but it was not present to point at. Instead, different children used the classifier to keep the shape of the object active enough in memory so that they could specify their descriptions of the imaginary weapons they were fighting with, the shoes and purses they wanted to wear, the ladders they wanted their mothers to draw, the lost puzzle pieces they were searching for, and the drawing of the monkey which the child had remembered from several pages back in the story. The child's representation system is organized more in terms of actions toward the referential field than toward visual images of it. (Moeser, 1977.) Overextension of a functional classifier would not reinforce these fundamental perceptual schema in the way that overextension by shape does.

II.B INFORMATIVENESS ARGUMENTS. Classifying objects by shape is reliably informative rather than arbitrary. The function of an object may be unknown, or variable over time, as when a tractor tire is turned into a planter, or the word "oven" comes to connote a steel and plastic microwave, rather than a red brick dome. Adults commonly describe unfamiliar objects by shape rather than function. A newborn child enters a world where all objects are equally unfamiliar, but some shapes are neurologically more recognizable and memorable than others. Soon she will pretend that the same wooden block is a car, a turtle, and a telephone, all in rapid succession.

Shape is still available to us by touch even when we are in the dark, looking away, or blinded. Human beings naturally recognize basic "good" shapes in sticks, circles and spheres even if they have not been taught words for them. (Rosch 1978). American Sign Language contrasts 1-D, 2-D, and 3-D in its noun classifiers for objects which are long and sticklike, flat, spherical, or domelike. (Newport, 1982). These shape classifiers developed iconically from the hand's experience handling objects.[3] New objects are classified by shape in ASL; ASL signers also frequently overgeneralize by vertical extension. In ASL, as in spoken languages, function classifiers are derived from the shape classifiers.[4]

The three-way distinction between 1-D, 2-D, and 3-D is a maximally contrastive closed set which is highly accessible for fast conceptual mapping. The earliest-learned and generalized classifier only has a single dimensional feature, while the next to be mastered has two. Classifiers for three dimensional features are the latest acquired and the most diverse. In syntactic acquisition, there is no three-word stage, because the child who has mastered two-word utterances can generate complex sentences. In the same way, we seldom find a stable 3-D classifier, because the

three-dimensional world is so diverse that it quickly subdivides by size and functions. **II.C REINFORCEMENT FROM NATURAL FORMS.** The natural world reinforces primary shapes, beginning with the child's experience with her own body. The child's own hand is the first object which fascinates her enough to examine it in detail. Not only does she stare endlessly at her extended, rod-like fingers, hands, and arms, but she probes them from many angles, tactually, haptically, and kinesthetically, with her other hand, her mouth, and the rest of her body as well. The child models an analog of the physical world starting with a cross-sensory image of her own body.[5] Later the child follows her extended hand to reach for, then point at objects just beyond her finger. She insists on touching things rather than just looking at them. The natural world is full of other vertical forms, including the legs, shoes and feet the child spends so much time looking at from floor level, as well as trees, sticks, and stalks.

Flat objects are abundant also, including all sorts of bedding and cloths, as well as paper and leaves. Newborns prefer to look at round or spherical shapes, either the mother's eyes, face, head, and breasts, or schematic versions of these which are displayed in the lab. The prototypical 3-D classifier is usually a fruit or an egg. **II.D PERCEPTUAL REINFORCEMENT.** Newborns can distinguish vertical forms; they prefer 90 degree verticals because of specialized retinal cells. Distinguishing three-dimensional verticals is a very complex achievement, since a person orienting to a true vertical cannot satisfy both background and kinesthetic equilibrium at once if these conflict. Both children and adults will "correct" a non-upright form to a vertical as they copy it. Notice, however, that sorting by shape assumes a object constancy, the assumption that shape will be the same from whatever side you view it, despite the angle of your body or head. (Braine, 1979.)

Verticality as a "canonical encounter" is reinforced kinesthetically by the vestibular apparatus in response to gravity. (H. Clark, 1979.) Infants have such a strong preference for the vertical body position that they will frequently stop crying if they are picked up and held vertically rather than horizontally.[6] Standing and walking reinforces the importance of upright extension.

Object sorting indicates that the canonical dimensions used in shape classifiers are perceptually programmed before they can be discussed. Infants are born perceiving the difference between flat and solid objects. They prefer 3-D objects because of their innate sense of depth. (Gregory, 1966.) Sugarman (1983) found that both deaf and hearing infants went through the same stages of sorting toys by overall similarity of form , rather than by color or function. First they contrasted long cylinders with flat rings. Then they inserted the cylinders upright in the rings. Perception of horizontals and flat objects is much later than perception of verticals; there is less evidence for specific retinal receptors for horizontals. Only then were the children able to sort objects by function, by color, or by size.

When young children are given objects to sort where there is a choice between shape and function, as in a variety of long or square wooden boats and pans, they will sort by shape before function. (Tomikawa and Dodd, 1980; Ruff, 1980.) Sugarman found that early sortings grew out of action schema for bedtime, pretend meals, and other ritualized actions which were well rehearsed, and that "the conceptual liking of discrete objects or states occurs with equal facility whether or not the elements being related are immediately perceptible (as opposed to being absent or imagined."[8] This exactly matches the Chinese children's discourse strategy of using the specific classifiers precisely when objects they were describing were NOT present.

ILE CROSS-MODAL REINFORCEMENT. Perception is a unified, cross-modal system, rather than being merely vision with a small amount of other sensory input to call on in an emergency. Sensori-motor intelligence depends on the whole body's manipulations of physically stable objects. The Chinese children only used specific classifiers with grammatical patients which were being created or acted on by animate agents. They did not ever use a classifier with a grammatical agent.

Further evidence comes from the sequence of the infant's generalization: from touch and haptic examination of objects which she manipulates directly, to analysis of distant objects by eye and ear. There may be an intensity-based, inter-modal equivalence in input which makes it possible for stimulation in one sense to be generalized to the same category presented by another. For example, infants who mouth objects without seeing them recognize them better when the objects are presented visually. (Benton, 1979.) This shift parallels the extension of classifier development from concrete prototypical objects to distant, conventionalized ones.

This integration of sensori-motor action schema with shapes symbolized in language helps explain Casagrande's 1966 finding. Navaho-speaking children, whose language has shape classifiers, mastered object sorting by shape as did advantaged white English-speaking children. Disadvantaged Navaho children, who were native speakers of English, did not sort by shape. Linguistic stimulation by classifiers may help children with extremely limited experience develop shape categories which might not otherwise have matured on schedule. Shape classifiers are highly unusual in the way they reinforce the child's discovery of the physical world. Functional classifiers, which mark more arbitrary vcategorizations, may not be so helpful to disadvantaged children. In addition, classifiers are governed by shifting discourse needs rather than object qualities. Children generally find discourse control much more difficult than lexical reference.

Children and adults live in the same bodies in the same world. Adults have more sophisticated functional and stylistic categories than children. But when either is under communicative stress, both revert to the same simplified pragmatic mode of using common, perceptually-based shape classifiers which they can count on their listener to have felt quite literally in her bones.

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1. For overview of classifier systems, see Adams and Conklin. For cross-linguistic comparison, see Allan, as well as articles in Craig. For discussion of Mandarin adult and child usage, see Erbaugh.

2. Chinese is extremely unusual in that it has never had a special class for humans, and only one honorific classifier, in the more than 3,000 years of classifier history.

3. Chimps were able to recognize contrasts among these signed shape classifiers, although they did not learn to use them. Supalla, personal communication.

4. Supalla, personal communication.

5. Aphasics typically fail to develop or maintain this haptic sense of body, hand or finger form. Benton 1979.

6. Traditional carrying postures in many cultures tacitly demonstrate this, as do the many portraits of madonnas and child, where the children modelling as Christ were able to tolerate posing only when they were held vertically.

7. Some children with right hemisphere damage are able to respond to verticals, but cannot process other dimensions, including horizontals. Personal communication from Elizabeth Bates concerning work by Joan Stiles-Davis at U.C. San Diego.

8. Sugarman, 1983, p. 200.